Central Puget Sound
Regional Fare Coordination System

CDRL 13 - PT Installation Procedure - Gillig Hybrid Bus

Document No: **SEA-06829** **Category:** **Revision:** **2.0**
Publisher: ERG Transit Systems **Revision Date: April 18, 2011**

ERG Approvals	Author	Process Manager	Manager
Name:	Matt Hulbert	Richard Mussell	Elaine Aulgur
Signature:			
Date:			

This material is delivered to the Contract Administrator under Contract No. 229944, a Contract for the Development, Operation and Maintenance of the Central Puget Sound Regional Fare Coordination System. The material is copyright protected and, except as provided in that Contract, may not be reproduced, stored in a retrieval system or transmitted in any form or by any means in whole or in part without the express written consent of ERG.

Confidential

Document History

Revision	Revision Date	Reason for Issue	Author
0.1	10 Feb 2011	First draft	Matt Hulbert
0.2	8 April 2011	Add additional detail	Matt Hulbert
0.3	8 April 2011	Update documentation	Matt Hulbert
0.4	11 April 11	Peer Review	Gene Dvorak
0.5	11 April 11	Edit for submittal	Joan Bayer
1.0	12 April 11	Release to Customer	Elaine Aulgur
1.1	18 April 11	Addressed Agency Comments	Matt Hulbert
1.2	18 April 11	Edit for submittal	Joan Bayer
2.0	18 April 11	Release to Customer	Elaine Aulgur

Contents

1 Introduction 4
  1.1 Purpose 4
  1.2 Overview 4
  1.3 Terminology 5
  1.4 References 5
2 Installing the Devices 6
  2.1 Mounting the DDU 6
  2.2 Mounting the OBFTP 7
  2.3 Mounting the WDOLS, Ethernet Switch, and Antenna 9
    2.3.1 Mounting the WDOLS and Ethernet Switch 10
    2.3.2 Mounting the Antenna 10
  2.4 Mounting the LDM and Circuit Breaker 11
3 Installing the Cables 13
  3.1 Cabling the Circuit Breaker and LDM 13
  3.2 Installing the DDU Cables 16
  3.3 Installing the OBFTP Cables 18
  3.4 Installing the WDOLS and Ethernet Switch Cables 19
    3.4.1 Installing the Power and Ethernet Cables 19
    3.4.2 Installing the Antenna Cable 19

List of Tables

Table 1: Acronyms and Abbreviations 5

List of Figures

Figure 1: DDU Location 6
Figure 2: OBFTP Location 7
Figure 3: OBFTP Mounting Bracket Detail 8
Figure 4: WDOLS and Ethernet Switch Location 9
Figure 5: Antenna Location 10
Figure 6: LDM and Circuit Breaker Location 11
Figure 7: Circuit Breaker Power Cable Route to LDM 12
Figure 8: LDM Wiring 14
Figure 9: Circuit Breaker - Detail 15
Figure 10: Power and Ethernet Cable Routing 16
Figure 11: Radio Box 17
Figure 12: Antenna Cable 19

1 Introduction

This installation procedure for the Gillig Hybrid Bus at Pierce Transit shows installation technician(s) where and how to mount all devices that are part of the Regional Fare Coordination System (RFCS), and how to install the cabling required to ensure correct and reliable system operation.

These six devices make up the installation kit for each bus:

- **The On-Board Fare Transaction Processor (OBFTP):** This is the master device in the system. It contains the smart card reader and is the customer interface.
- **The Driver Display Unit (DDU):** The bus operator uses this device to input passenger counts, route information, and other data. This device also displays messages on screen for the operator.
- **The Wireless Data On/Off Loading System (WDOLS):** This device changes the data from a Category 5 input to a 2.4GHz wireless signal and back to Category 5. There are two parts to the WDOLS system:
    - The Power Injector: The Ethernet and the power cables plug into this unit's input ports. The output of this unit powers the Cisco 1310 Access Point/Bridge.
    - The Cisco 1310 Access Point/Bridge: The power injector cables plug to the inputs of this unit. The antenna plugs directly to the output of the unit as a reverse bayonet Neill-Concelman (BNC) connector.
- **The Antenna:** An upgraded external antenna can be fitted to the WDOLS unit to allow for an omni-directional signal to be transmitted and received.
- **The Ethernet Switch:** This small device acts as a junction for the three Category 5 cables that come from the OBFTP, DDU, and WDOLS. These devices are connected using Category 5 cabling.
- **The Load Dump Module (LDM):** This device protects the equipment from voltage transients and spikes that may be caused by the bus electrical system.

1.1 Purpose

This illustrated installation guide describes the position and methods of mounting the ERG-supplied devices. It also shows how and where the required cabling should be installed for correct and reliable operation.

1.2 Overview

The locations and photographs in this guide depict the following:

- Where and how to mount the equipment
- The location of attachment points for power
- All details of cable routing

1.3 Terminology

This section contains a list of acronyms, abbreviations, and terms used in this document.

Table 1 contains the acronyms and abbreviations that are specific to ERG. Industry-standard acronyms and abbreviations are not defined in this table.

Table 1: Acronyms and Abbreviations

Acronym or Abbreviation	Definition
BNC	Bayonet Neill-Concelman RF Connector
DDU	Driver Display Unit
PT	Pierce Transit
LDM	Load Dump Module
OBFTP	On-Board Fare Transaction Processor
RFCS	Regional Fare Coordination System
WDOLS	Wireless Data On/Off Loading System

1.4 References

[1] Contract 229944 (April 29, 2003),
Division III: Equipment Specifications

[2] SEA-02088,
Generic On-Board Installation Instruction

[3] SEA-06922 Pierce Transit-Bill of Materials

2 Installing the Devices

The procedures for mounting the devices, the antenna, and for running all the cables are the same for all Gillig Hybrid buses at PT.

2.1 Mounting the DDU

The PT RAM mount was chosen to provide an adjustable mount for the DDU. The DDU is secured to the mount and positioned as shown in Figure 1.

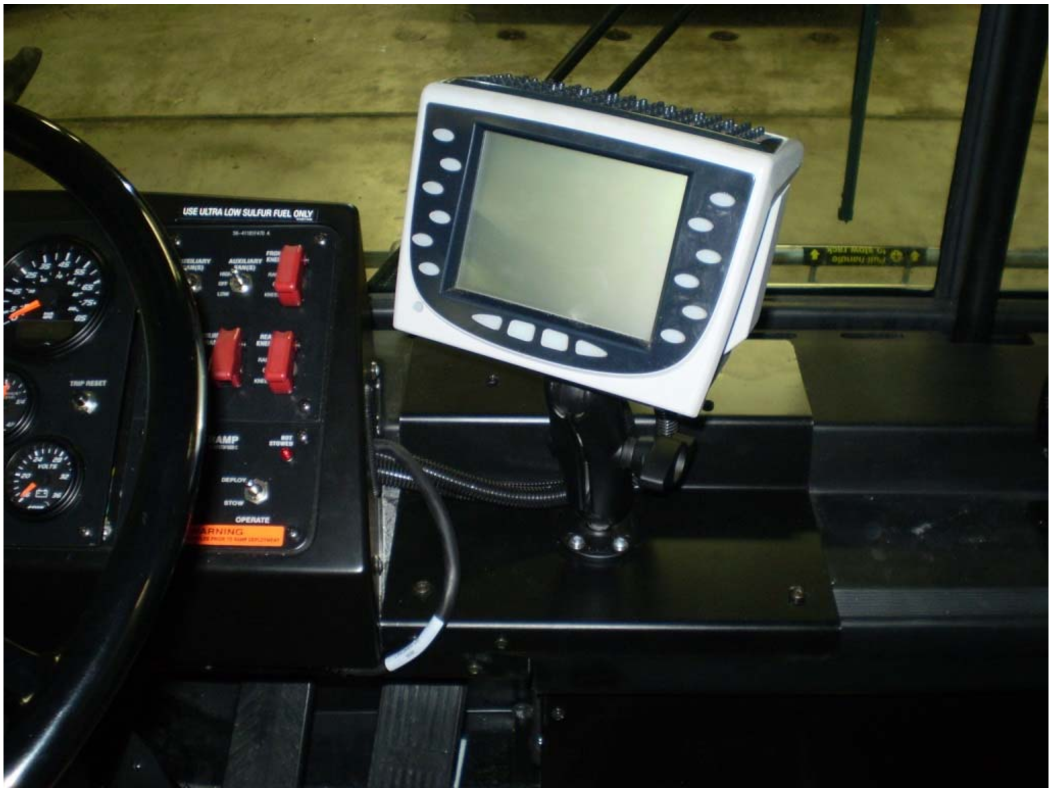


Figure 1: DDU Location

1. The DDU cradle plate is pre-drilled to make installation easier. The DDU cradle holes match with the RAM ball mount. If the holes do not match, either the DDU cradle or RAM ball mount has been pre-drilled incorrectly and should be replaced.
2. Secure the DDU cradle to the RAM ball mount with three M5x20mm Philips screws and nyloc nuts. Do not over tighten the nuts. Ensure true and secure mounting of the cradle to the plate.
3. Place the DDU onto the DDU cradle as shown in Figure 1. Lock the DDU to the cradle using the key provided.
4. The RAM mount is secured to the dash plate as shown in Figure 1 using nyloc nuts, bolts and fender washers.

Comment [jb1]: COM-v1.0-001

Deleted: Determine the defective part and quarantine it.

2.2 Mounting the OBFTP

The OBFTP mounting position and method is on the right-hand side of the passenger boarding the bus (see Figure 2). The OBFTP bracket is fixed to a vertical stanchion, which is secured to a base clamp. The base clamp is fixed to the dash using nyloc nuts bolts and fender washers. The cabling for the device runs through the vertical stanchion and base clamp into the dash cavity. The hole for the cables to pass through the dash are already in place from the previous installation of the fan.

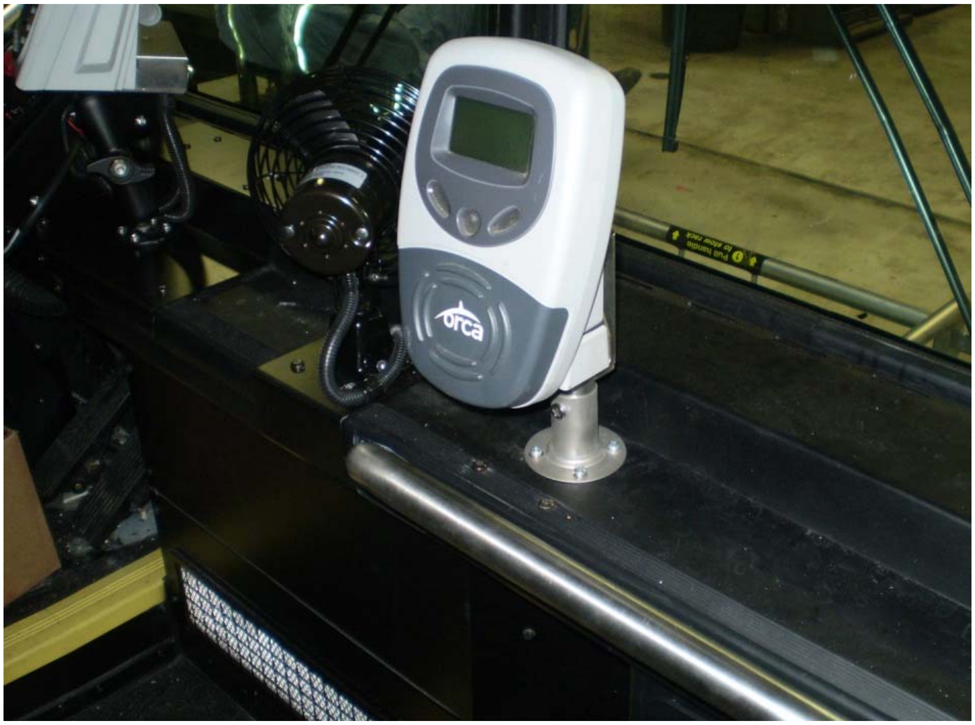


Figure 2: OBFTP Location

1. Remove the center locating screw from the OBFTP bracket. Insert a 7-inch vertical stanchion into the base clamp until it will not go any farther. Fit the OBFTP bracket to

the vertical stanchion. The bottom of the OBFTP bracket should touch the top of the base clamp, i.e., the OBFTP bracket should sit as low on the stanchion as possible.

2. Mark the location of the hole for the locating screw to bolt into the stanchion by punching a mark through the hole as shown in Figure 3.

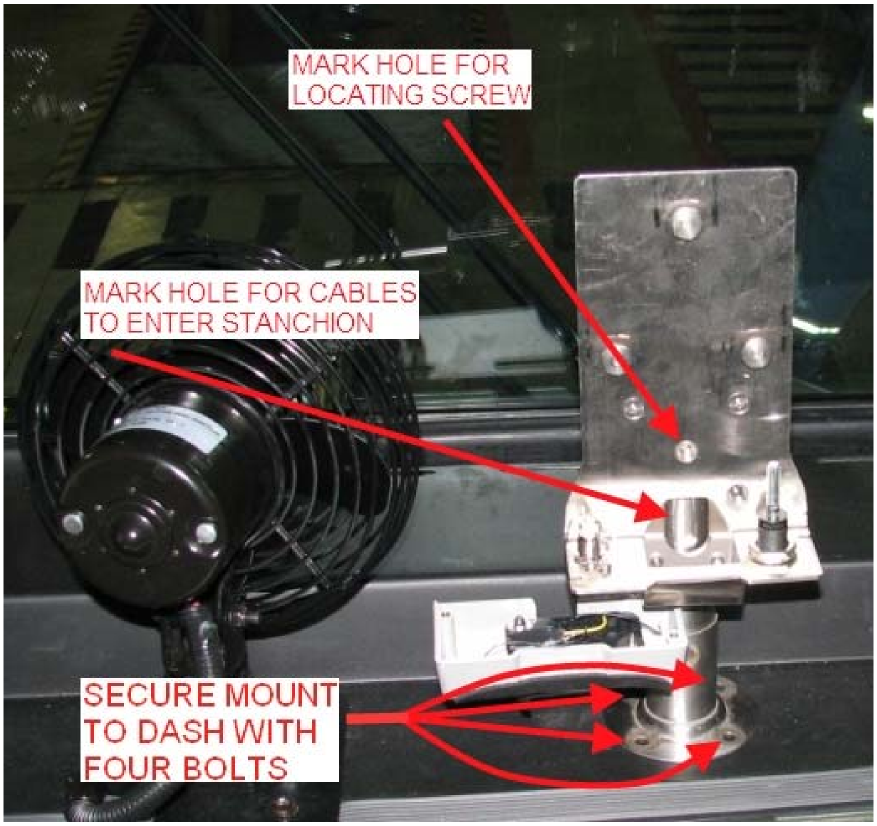

MARK HOLE FOR LOCATING SCREW
MARK HOLE FOR CABLES TO ENTER STANCHION
SECURE MOUNT TO DASH WITH FOUR BOLTS

Figure 3: OBFTP Mounting Bracket Detail

3. Mark the location for the hole for the cable to exit the vertical section and enter the OBFTP bracket by punching a mark in the center of the cutout of the bracket.
4. Mark the hole in the stanchion for the bolt to go through.
5. Remove the vertical stanchion from the base clamp. Position the base clamp on the dash panel.

Mark four holes in the dash for bolts. Mark the hole in center of the base clamp for the cables to pass through into the dash.

6. Drill the required holes:
   a. Drill a 7/32-inch hole through the vertical stanchion for the locating screw.
   b. Drill a 3/4-inch hole in the bottom of the vertical stanchion where indicated to allow cables to pass through into the OBFTP cradle. De-bur the hole and insert the grommet edging provided.
   c. Drill a 3/8-inch hole in the vertical stanchion for the base clamp through bolt.

   d. Drill four ¼-inch holes for bolts to mount the base clamp to the dash.

7. Fit the vertical stanchion to the base clamp as shown in Figure 3.
8. Secure the base clamp to the dash using bolts, nyloc nuts and fender washers.
9. Fit the OBFTP clamping bracket to the vertical stanchion as shown in Figure 3. Tighten the four Philips screws that hold the clamp in place and fit the locating screw to secure the unit.

2.3 Mounting the WDOLS, Ethernet Switch, and Antenna

The WDOLS is mounted on the second shelf of the Radio Box (Figure 4). The Ethernet switch is also mounted in this location.   The WDOLS is secured to a plate that has been provided by PT.

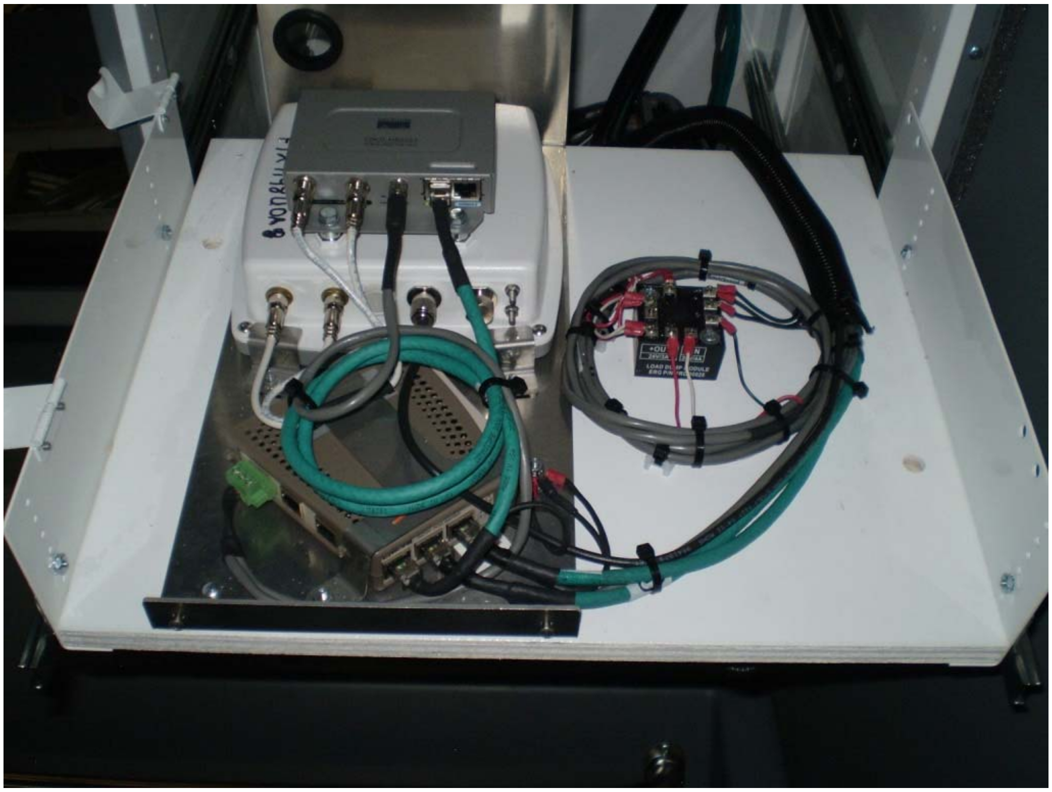


Figure 4: WDOLS and Ethernet Switch Location

2.3.1 Mounting the WDOLS and Ethernet Switch

1. Position the plate securing the WDOLS and Ethernet switch.
2. Secure the plate to the tray using wood screws.

2.3.2 Mounting the Antenna

The antenna mounts to the roof above the Radio box and access panel as shown in Figure 5.

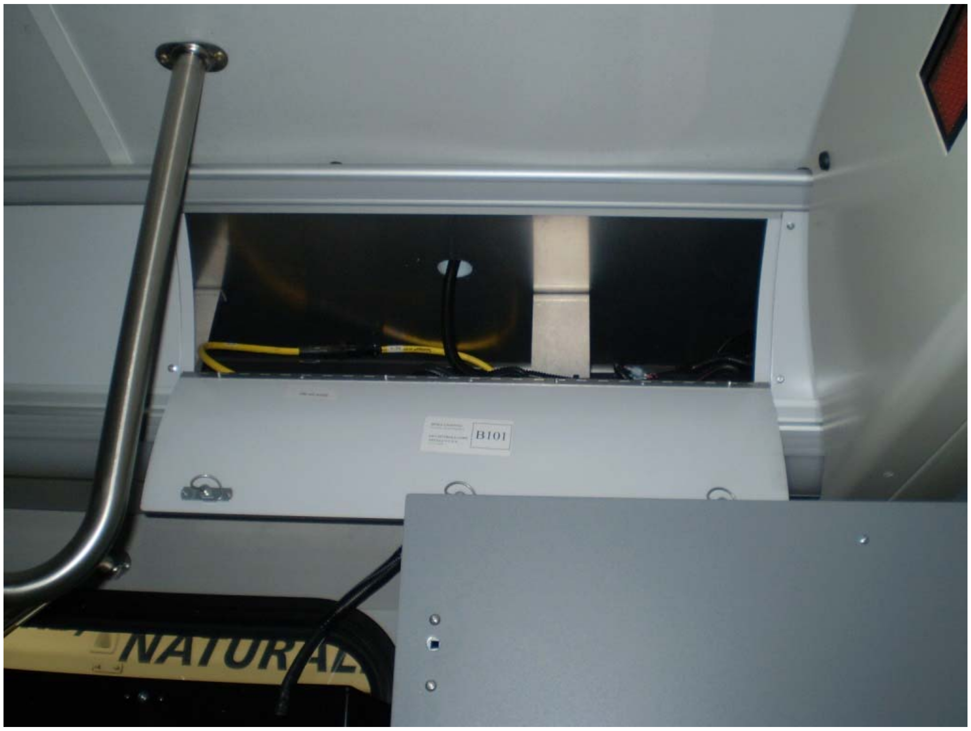


Figure 5: Antenna Location

1. Carefully mark a circle in the roof with a marker. Punch a mark.
2. Drill a 5/8-inch hole through the panel. Use a pilot drill where necessary.
3. De-bur the hole. Feed the antenna cable through the hole until the antenna sits firmly against the roof. Ensure the rubber seal is intact. Seal the antenna using appropriate sealer.
4. Slide the lock washer and then the nut over the cable end and run along the cable to the antenna thread. Tighten the nut.

2.4 Mounting the LDM and Circuit Breaker

1. Position the LDM as shown in Figure 4.
2. Mount the LDM with two #12 x 1 3/4-inch wood screws.
3. Position the circuit breakers as shown in Figure 6.
4. Mount circuit breakers using two self-drilling #10 screws.
5. Run the power cables to the Radio Box as shown in Figure 7.

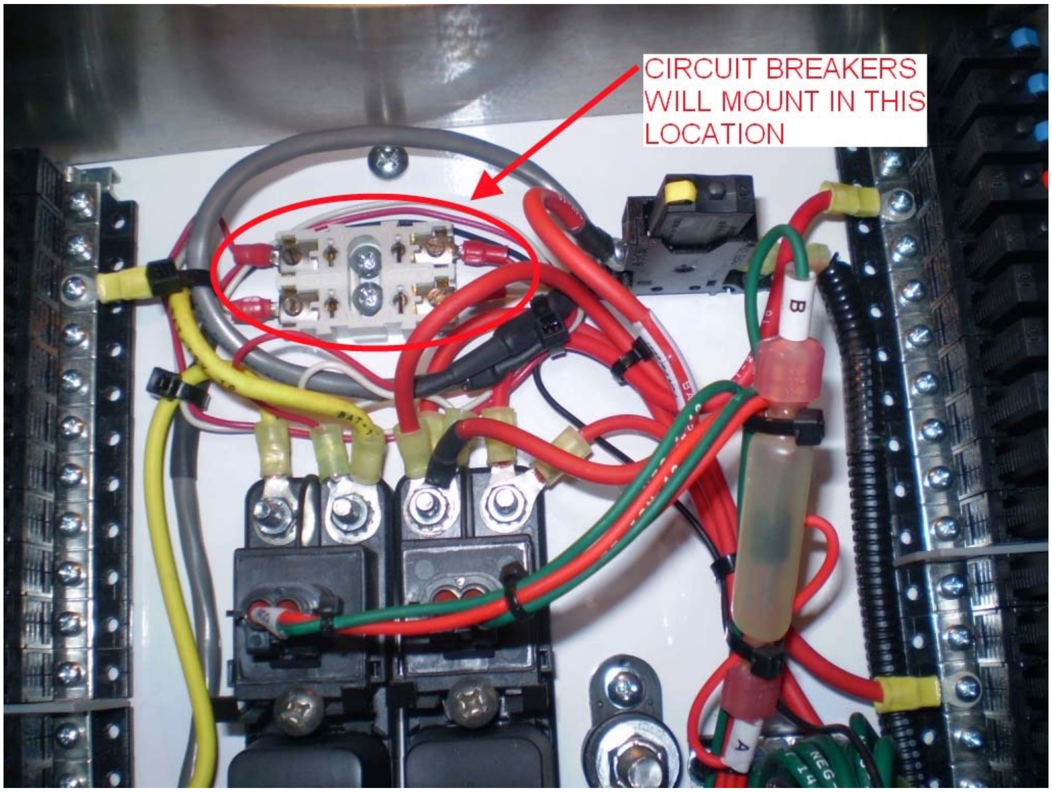
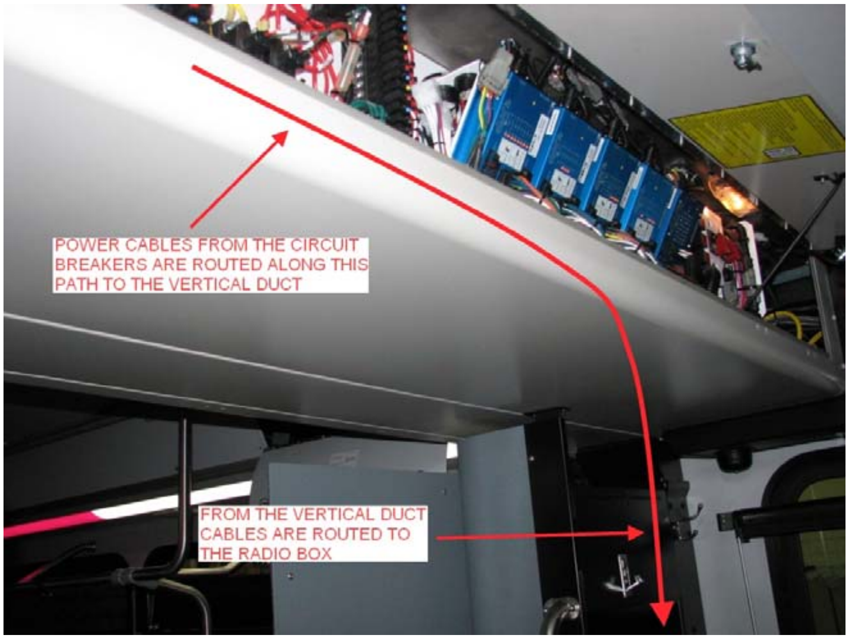


Figure 6: LDM and Circuit Breaker Location



POWER CABLES FROM THE CIRCUIT BREAKERS ARE ROUTED ALONG THIS PATH TO THE VERTICAL DUCT
FROM THE VERTICAL DUCT CABLES ARE ROUTED TO THE RADIO BOX

Figure 7: Circuit Breaker Power Cable Route to LDM

3 Installing the Cables

Power Cable Lengths:

LDM to Circuit Breakers	16 ft.
DDU to LDM	14 ft.
OBFTP to LDM	16 ft.
WDOLS to LDM	3 ft.

Power for the devices is taken from the power distribution panel above and behind the driver of the vehicle.

Ethernet Cable Lengths:

DDU to Ethernet Switch	14 ft.
OBFTP to Ethernet Switch	16 ft.
WDOLS to Ethernet Switch	3 ft.
Antenna cable length (supplied with antenna):	11 ft.

3.1 Cabling the Circuit Breaker and LDM

Two circuit breakers are installed in the bus. One breaker is fitted to the constant +24-V rail and the other breaker is fitted to the ignition (switched) +24-V rail. Figure 9 shows where power is taken from existing power studs to supply power to the LDM.

1. Install the cable to the power stud locations shown in Figure 9 using ring terminals.
2. Insert the constant power cable into the 4-amp breaker and the ignition power cable into the 1-amp breaker.
3. Run the constant power cable from the 4-amp breaker to the LDM and terminate the cable with ring terminal connectors. Attach the cables to the input terminals on the LDM. Terminate to the LDM as shown in Figure 8.

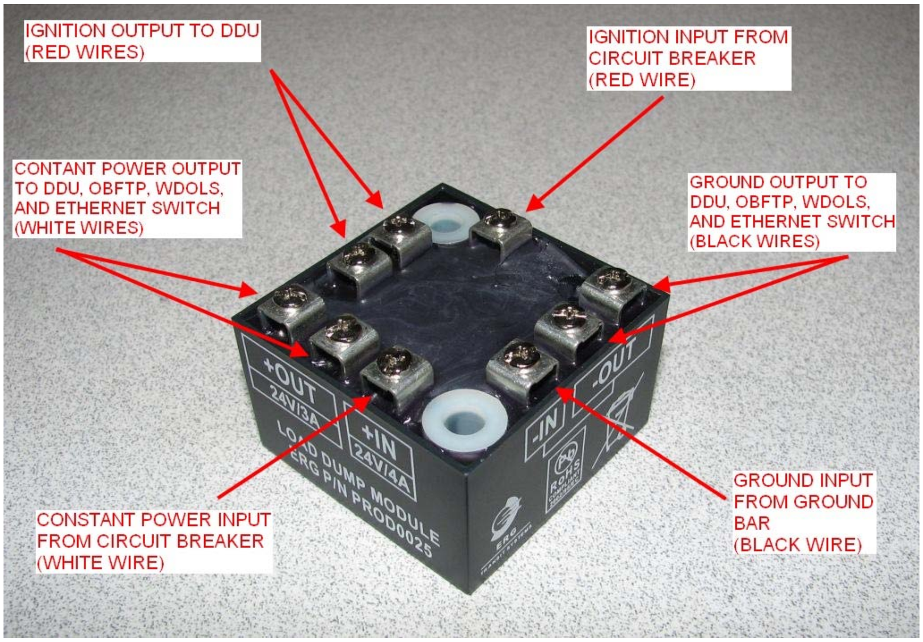

IGNITION OUTPUT TO DDU (RED WIRES)
IGNITION INPUT FROM CIRCUIT BREAKER (RED WIRE)
CONTANT POWER OUTPUT TO DDU, OBFTP, WDOLS, AND ETHERNET SWITCH (WHITE WIRES)
GROUND OUTPUT TO DDU, OBFTP, WDOLS, AND ETHERNET SWITCH (BLACK WIRES)
+OUT 24V/3A
+IN 24V/4A
-IN
-OUT
LOAD DUMP MODULE ERG P/N PROD0025
ROHS
CONSTANT POWER INPUT FROM CIRCUIT BREAKER (WHITE WIRE)
GROUND INPUT FROM GROUND BAR (BLACK WIRE)

Figure 8: LDM Wiring

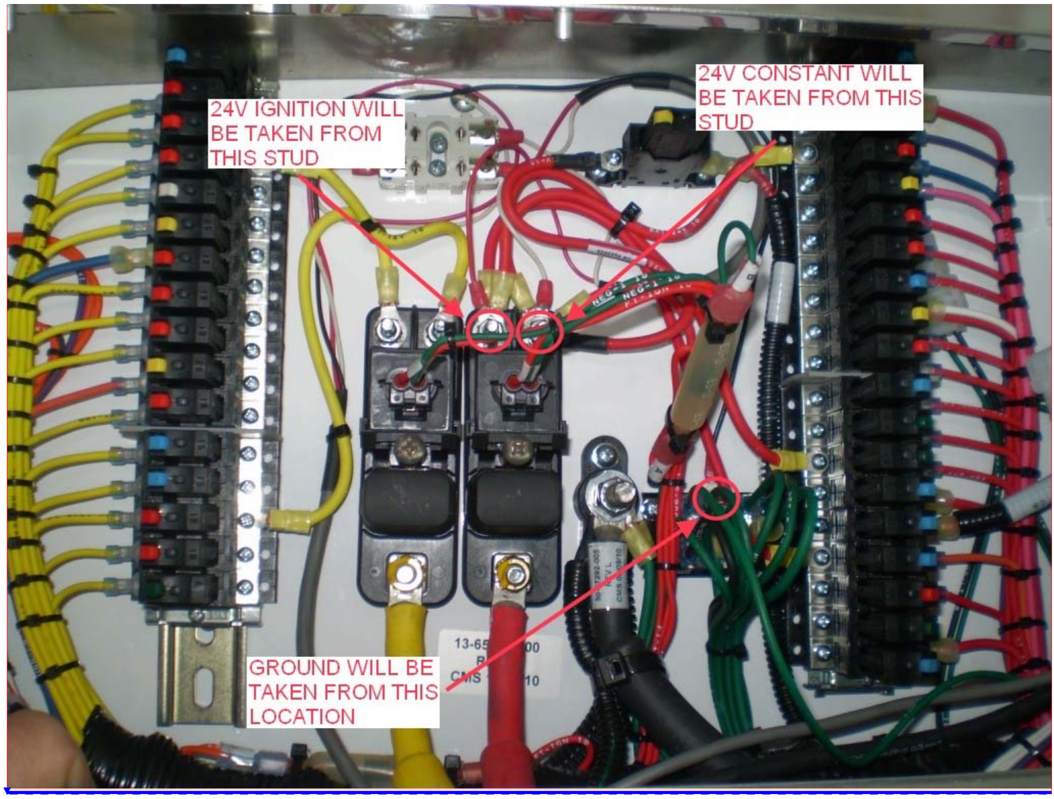
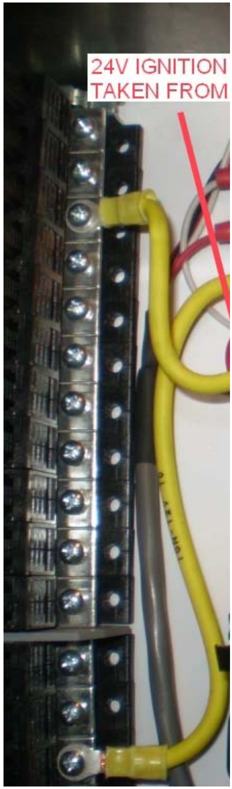

24V IGNITION WILL BE TAKEN FROM THIS STUD
24V CONSTANT WILL BE TAKEN FROM THIS STUD
GROUND WILL BE TAKEN FROM THIS LOCATION

Figure 9: Circuit Breaker - Detail

Comment [jb2]: COM-v1.0-002

Deleted:



3.2 Installing the DDU Cables

1. Run both cables from the DDU bracket through the hole in the dash panel to join existing cables as shown in Figure 10. Follow existing cable routes across to the vertical cable duct. Ensure that the cables are tied to existing looms and hidden from view.

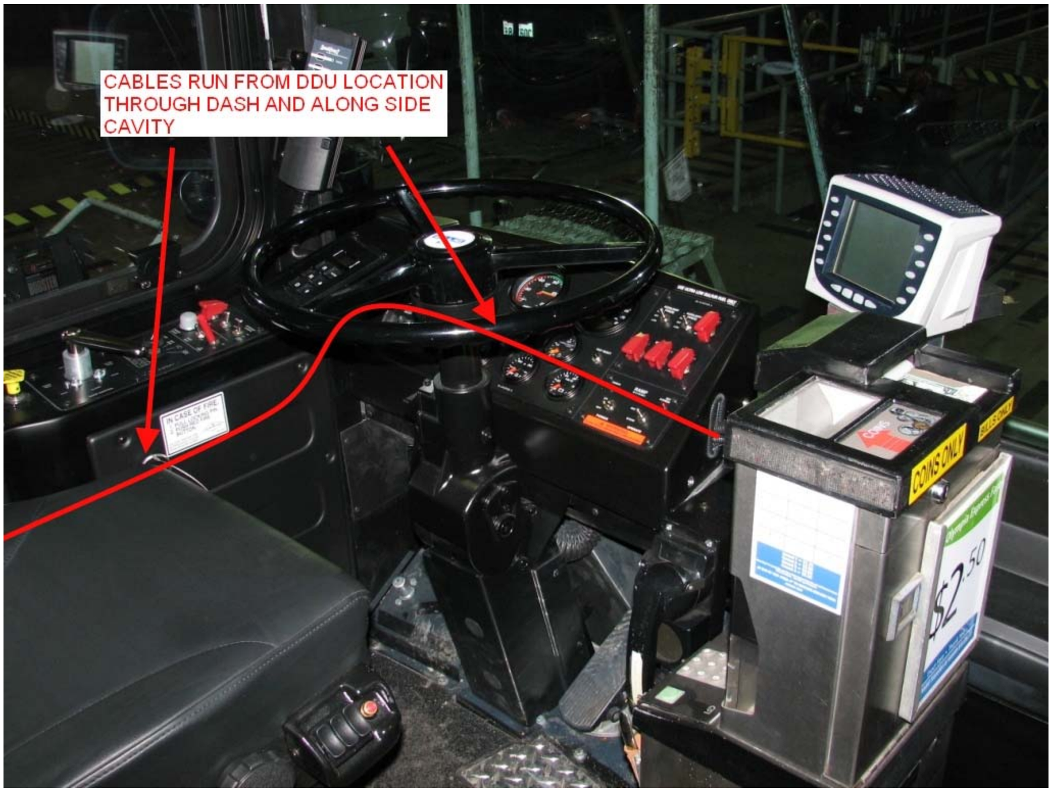

CABLES RUN FROM DDU LOCATION THROUGH DASH AND ALONG SIDE CAVITY
COINS ONLY
$2.50

Figure 10: Power and Ethernet Cable Routing

2. Remove the dash panel to the left and below the steering wheel of the bus. Run the cables from under the dash area to follow the existing looms that run toward the vertical cable duct.
3. Cables continue through to the radio box.

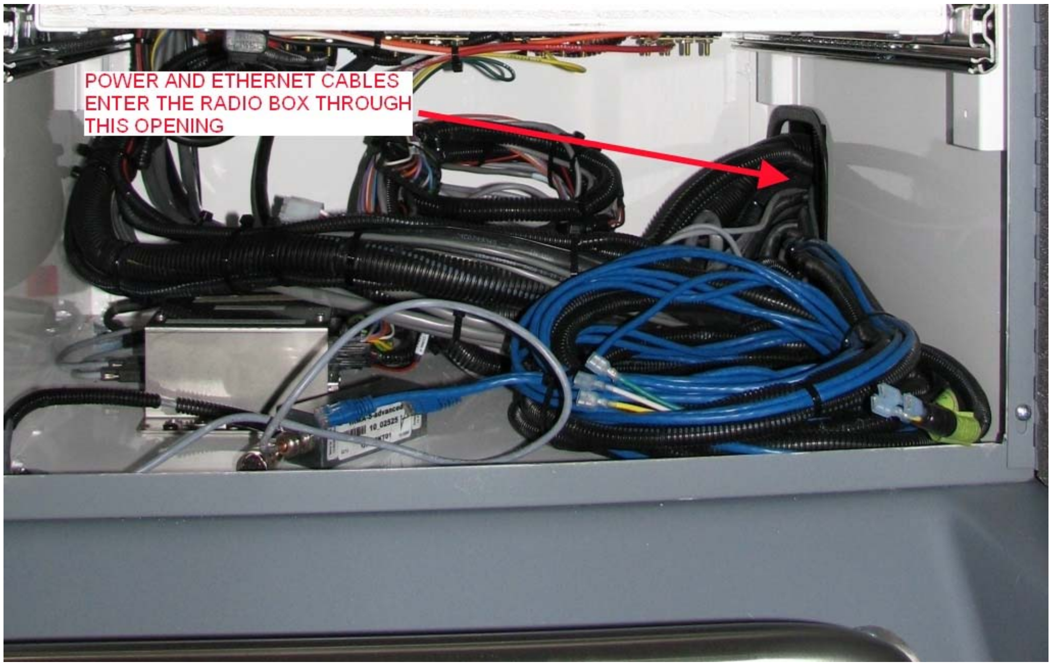

POWER AND ETHERNET CABLES ENTER THE RADIO BOX THROUGH THIS OPENING

Figure 11: Radio Box

4. Connect the constant and the ignition power cables to LDM using ring terminals.
5. Terminate the Ethernet cable as described in SEA-02088, Generic On-Board Installation Instruction [2].
6. Terminate the power and Ethernet cable at the DDU cradle as described in SEA-02088, Generic On-Board Installation Instruction [2].

3.3 Installing the OBFTP Cables

As described in Section 2.2, the cables should be run before the OBFTP bracket is secured to the dash.

Comment [jb3]: COM-v1.0-003

Deleted: handrail

1. Pass the power and Ethernet cables through the previously drilled vertical stanchion. Route both cables to join the DDU cables as they run into the dash area. When the cables are in the dash area, they follow the DDU power cables to the LDM and Ethernet Switch.
2. Terminate the OBFTP power cable to the LDM with ring terminals. Run the Ethernet cable to the Ethernet Switch.
3. Ensure grommet edging is fitted to holes in the vertical stanchion at the OBFTP location. Draw the cables through the vertical handrail and fit the OBFTP clamping bracket to the stanchion.
4. Terminate the Ethernet cable as described in SEA-02088, Generic On-Board Installation Instruction [2].
5. Terminate the power and Ethernet cable at the OBFTP cradle as described in SEA-02088, Generic On-Board Installation Instruction [2].

3.4 Installing the WDOLS and Ethernet Switch Cables

Power for the WDOLS and the Ethernet Switch run from the LDM. One cable from the LDM supplies power for both the Ethernet Switch and the WDOLS. A short Ethernet cable is used to join the Ethernet Switch to the Cisco Power Injector.

3.4.1 Installing the Power and Ethernet Cables

1. Run the power cable from the LDM to the Ethernet Switch. Terminate the cable in the Ethernet Switch connector and run an additional three feet of cable from the connector to the WDOLS. Terminate the WDOLS power connector and insert the connector into the Cisco Power Injector.
2. Cut three feet of Ethernet cable and terminate it according to the specifications detailed in SEA-02088, Generic On-Board Installation Instruction [2].

3.4.2 Installing the Antenna Cable

After the antenna is installed, route the antenna cable directly to the WDOLS and plug it into the WDOLS external antenna connector. The antenna cable will enter the radio box as shown in Figure 12.

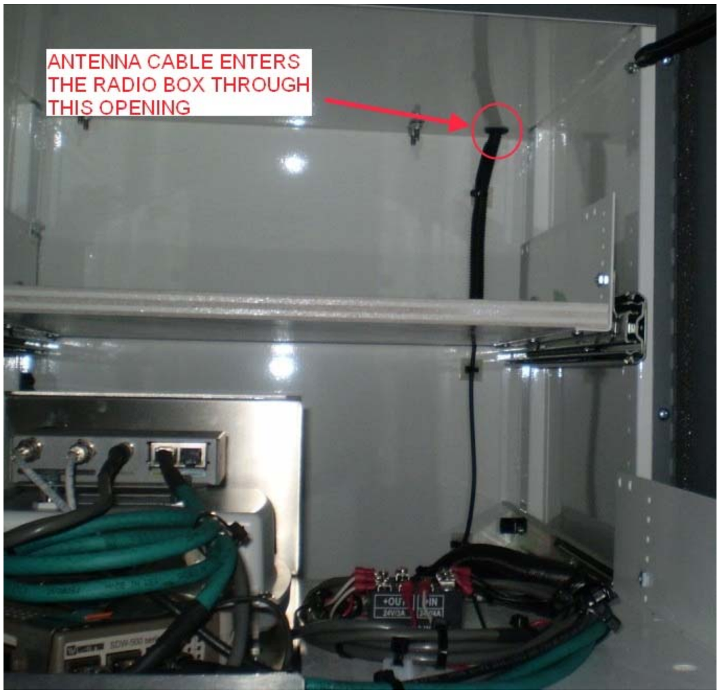


Figure 12: Antenna Cable